

Abstract of the thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

DESIGN AND DEVELOPMENT OF HIGH SENSITIVITY ERBIUM DOPED FIBER AMPLIFIER

By

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Various aspects concerning Erbium Doped Fiber Amplifiers (EDFA) for use in C-band transmission system were investigated through experimental work culminating in the design and implementation of three different C-band EDFA's. The most promising being an EDFA utilizing double pass with tunable bandpass filter (TBF) amplification scheme. The configuration is a new approach to increase the sensitivity of the preamplifier before the signal is received by the receiver. This is because, limited sensitivity preamplifiers offered in the markets that limit the fiber optic link design. Thus, a new approach is desirable in solving the problem. In this thesis, new technique is proposed to increase the sensitivity up to 10dB.

STM-1 and STM-4 Bit Error Rate (BER) test on SDH network was successfully conducted in a laboratory environment. The test showed that no error was introduced. Finally it is concluded that DPEDFA is reliable to be used as a device to realize high sensitivity preamplifier, as its realization would result in a huge increase in additional power budget with minimum installation and maintenance complexity and cost.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**REKABENTUK DAN PEMBINAAN PENGUAT GENTIAN BERDOPAN
ERBIUM BERSENSITIVITI TINGGI**

Oleh

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Beberapa aspek melibatkan Penguat Gentian Berdopan Erbium bagi kegunaan didalam system penghantaran jalur C, diasas melalui eksperimen – dimana ia melibatkan rekabentuk dan penerapan tiga jenis EDFA jalur C yang berbeza. Diantaranya, yang paling baik ialah EDFA menggunakan skim penggandaan laluan berganda dengan penuras jalur lepas boleh ubah. Konfigurasi ini adalah satu penemuan baru dalam meningkatkan kesensitifan pra-pengganda sebelum isyarat diterima oleh penerima. Ini adalah disebabkan pra-penganda yang kini berada didalam pasaran mempunyai kesensitifan yang terhad yang menyebabkan penghadan dalam rekabentuk talian fiber optik. Maka, satu kaedah baru diperlukan untuk menyelesaikan masalah ini. Dalam disertasi ini, satu teknik baru dicadangkan untuk meningkatkan kesensitifan sehingga 10dB.

Ujian STM-1 dan STM-4 di dalam rangkaian SDH juga telah berjaya dijalankan di persekitaran makmal menunjukkan tiada kesilapan berlaku. Akhir sekali disimpulkan bahawa DPEDFA mampu digunakan untuk merealisasi pra-pengganda bersensitiviti tinggi dan membuka jalan kepada peningkatan bajet kuasa dengan kerumitan dan kos pemasangan serta penjagaan yang minimum.

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I certify that an Examination Committee met on 30th September 2003 to conduct the final examination of Rosdisham bin Endut on his Master of Science thesis entitled “Design and Development of High Sensitivity Erbium Doped Fiber Amplifier” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for the quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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TABLE OF CONTENTS

ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGEMENTS	v
APPROVAL SHEETS	vi
DECLARATION	viii
TABLE OF CONTENTS	ix
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xvii

CHAPTERS

1	INTRODUCTION	1.1
1.1	Fiber Optics Communication System	1.1
1.2	Optical Amplifiers	1.2
1.3	Erbium Doped Fiber Amplifiers (EDFA)	1.3
1.4	Types of EDFA	1.4
1.4.1	Post Amplifier/ Booster	1.5
1.4.2	In-line Amplifier	1.5
1.4.3	Pre-Amplifier	1.5
1.5	Problem Definition and Critical Review	1.5
1.6	Suggested Economic Solution and Research Objective	1.7
1.7	Thesis Organization	1.7
2	FUNDAMENTALS OF OPTICAL AMPLIFICATION AND CHARACTERISTICS OF ERBIUM DOPED FIBER AMPLIFIER (EDFA)	2.1
2.1	Fundamentals of Optical Amplification	2.1
2.1.1	Three-Level Energy Mechanism	2.2
2.2	Characteristics of Single Pass Erbium Doped Fiber Amplifier (EDFA)	2.5
2.2.1	EDFA Gain	2.7
2.2.2	EDFA Noise Figure	2.7
2.2.3	Gain and Noise Figure as a Function of EDFA Parameter	2.9
2.3	Characteristics of Double Pass Erbium Doped Fiber Amplifier (EDFA)	2.11
2.4	Characterization of EDFA using Optical Spectrum Analyzer	2.13
2.5	Figure of Merit (FOM)	2.15
3	DESIGN AND CHARACTERIZATION OF SINGLE PASS EDFA	3.1
3.1	Single Pass Amplification	3.1
3.2	Active Components	3.3
3.2.1	Pump Sources	3.3
3.2.2	Signal Sources	3.7

3.3	Passive Components	3.9
3.3.1	Wavelength Division Multiplexing (WDM)	3.9
3.3.2	Optical Isolator	3.10
3.3.3	Erbium Doped Fiber (EDF)	3.11
3.4	Experimental Works Employing Unidirectional Pumping	3.12
3.4.1	Pump Power Dependent	3.13
3.4.2	Input Signal Power Dependent	3.22
3.4.3	Input Signal Wavelength Dependent	3.24
3.5	Conclusion	3.29
4	DESIGN AND CHARACTERIZATION OF DOUBLE PASS EDFA	4.1
4.1	Double Pass Amplification	4.1
4.2	Optical Circulator	4.2
4.3	Double Pass EDFA Experimental Setup	4.5
4.4	Results and Discussion	4.5
4.4.1	Pump Power Dependent	4.5
4.4.2	Input Signal Power Dependent	4.12
4.4.3	Input Signal Wavelength Dependent	4.14
4.5	Conclusion	4.18
5	DESIGN AND CHARACTERIZATION OF DOUBLE PASS EDFA WITH TUNABLE BANDPASS FILTER (TBF)	5.1
5.1	Double Pass EDFA Incorporating Tunable Bandpass Filter (TBF)	5.1
5.2	Investigation on Tunable Bandpass Filter (TBF)	5.2
5.3	Double Pass EDFA with TBF Experimental Setup	5.3
5.4	Results and Discussion	5.5
5.4.1	Gain and Noise Figure Performance with Various Pump Powers	5.5
5.4.2	Signal Induced Saturation	5.9
5.4.3	Input Signal Wavelength Dependent	5.10
5.5	Conclusion	5.12
6	NETWORK TESTING	6.1
6.1	Introduction	6.1
6.2	Design Parameters	6.2
6.2.1	Input Signal Power Dependent	6.2
6.2.2	Bit Rate Dependent	6.2
6.2.3	Pump Power Dependent	6.4
6.3	Synchronous Digital Hierarchy (SDH) Analyzer	6.4
6.3.1	SDH Performance Indicators	6.5
6.3.2	Bit Error Rate (BER)	6.8
6.4	BER Tests	6.9
6.4.1	Experiment Setup for STM-1 and STM-4 using SDH Analyzer	6.9
6.4.2	Experiment Setup for STM-16 using DTA.	6.13
6.5	Conclusion	6.16
7	CONCLUSION AND FUTURE WORKS	7.1

7.1 Conclusion	7.1
7.2 Suggestions for Future Works	7.3
REFERENCES	R.1
APPENDICES	A.1
BIODATA OF THE AUTHOR	A.1
CONFERENCES	A.1
AWARDS	A.1